

Title	Spacial Occurrence of 91 Intertidal Animal Species on Hatakejima Island, 1983
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Citation	PUBLICATIONS OF THE SETO MARINE BIOLOGICAL LABORATORY (1985), 30(4-6): 325-332
Issue Date	1985-12-25
URL	http://hdl.handle.net/2433/176106
Right	
Type	Departmental Bulletin Paper
Textversion	publisher

Spatial Occurrence of 91 Intertidal Animal Species on Hatakejima Island, 1983

On 13th May and 23rd August in 1983, members of the Seto Marine Biological Laboratory carried out the investigation on the distribution of 91 species of intertidal animals on Hatakejima Island (the Experimental Field of the Seto Marine Biological Laboratory; 33°42'N, 135°22'E) in order to monitor the recent biotic state of its coastline.

The 91 species were selected because of the easiness in search and identification in the field by their large sizes. The intertidal area of Hatakejima Island was divided into four "Areas" which correspond to the west, north, east and south shores of the island (Fig. 1). Areas I and II faced the innermost part of Tanabe Bay and were

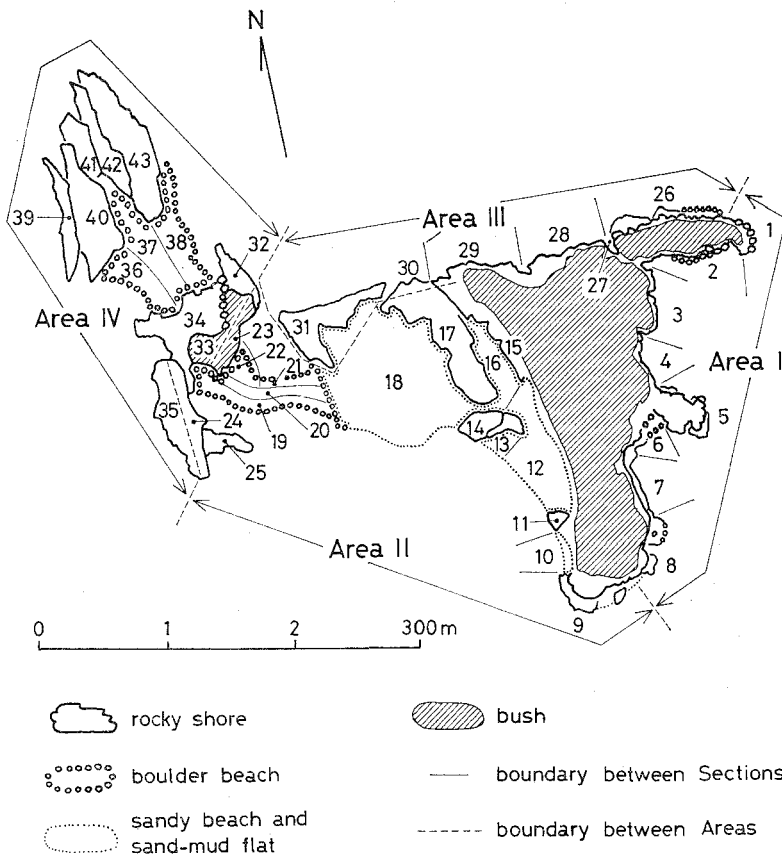


Fig. 1. Map of Hatakejima Island showing Areas and Sections. Arabian numerals indicate Section numbers.

less exposed than Areas III and IV which faced the bay mouth (for the general feature of the island, see Tokioka, 1969, Publ. Seto Mar. Biol. Lab., 17: 1-6). Each of the Areas was subdivided into "Sections" and the number of the Sections was 43 in all. Relative abundance of 57 species on rocky shore and 51 species on boulder beach, sand beach and sand-mud flat were evaluated and classified into four ranks: abundant, common, rare and not found. It took 20 to 30 min. for 5 to 8 persons to complete the survey in one Section. The results are shown in Tables 1 and 2.

Rocky shore (Table 1)

On rocky shore, the following 13 species were searched besides the species listed in Table 1, but were not found in any Sections: *Diloma suavis*, *Nerita albicilla*, *Heminerita japonica*, *Planaxis surcatus*, *Clypeomorus humilis*, *Siphonaria sirius*, *Modiolus auriculatus*, *Hormomya mutabilis*, *Asterina pectinifera*, *Holothuria pardalis*, *Pseudocentrotus depressus*, *Echinometra mathaei* and *Tripneustes gratilla*. For each of the following 6 species, only one individual was encountered: *Serpulorbis imbricatus*, *Japeuthria ferrea*, *Diadema setosum*, *Mespilia globulus*, *Holothuria leucospilota* and *Afroccumis africana*. For the 25 species commonly found on rocky Sections, three patterns of relative abundance among the four Areas were recognized (Table 3). Among the 25 species, 5 were most abundant in the sheltered Area I, 10 were most abundant in the exposed Area IV and the other 10 were equally abundant in all the Areas.

Boulder Beach, Sand Beach and Sand-mud Flat (Table 2)

On boulder beach, sand beach and sand-mud flat, the following 4 species were searched besides the species listed in Table 2, but were not found in any Sections: *Siphonaria sirius*, *Mespilia globulus*, *Pseudocentrotus depressus* and *Tripneustes gratilla*. On Hatakejima Island, boulder beaches of considerable expansion are located in Sections 2 and 6 (Area I), Sections 19 to 22 (Area II) and Sections 36 to 38 (Area IV). For the 24 species commonly found in the boulder Sections, three patterns of occurrence among the above three Areas were recognized (Table 4). Among the 24 species, 12 were widely recorded from Areas I, II and IV, 9 were from Areas II and IV, and the other 3 were exclusively from Area IV. Therefore, if the estimation is confined to the above 24 species, more species tend to be found in more exposed beaches.

Comparison with the Previous Data

In 1970 and 1971, distributions of two mussels, *Hormomya mutabilis* and *Modiolus agripetus* (= *M. auriculatus*) were investigated in the intertidal area of Hatakejima Island (Senawong, 1972, Publ. Seto Mar. Biol. Lab., 19: 269-291). At that time *H. mutabilis* was found on the whole coast and *M. auriculatus* mainly in the western half of the island. Their carpet-like colonies were observed in many places on the rocky shore. In 1983, however, none of the two mussels were found in the whole intertidal area of the island.

Distribution of sea urchins around Hatakejima Island was investigated in 1975 (Takahata et al., 1984, Nanki-seibutu, 26: 25-29). At that time, *Anthocidaris*

crassispina, *Echinostrephus aciculatus*, *Echinometra mathaei* and *Mespilia globulus* were distributed in all the Areas (I to IV). *Pseudocentrotus depressus* was found in Areas I and IV, and *Hemicentrotus pulcherrimus* in Areas III and IV. However, in 1983, the ranges of *A. crassispina* and *E. aciculatus* were limited to Areas III and IV, that of *M. globulus* and *H. pulcherrimus* were limited to Area IV, and *E. mathaei* and *P. depressus* were not found on the whole coast. Thus, sea urchins in general were distributed widely around the island in 1975 but were restricted to the exposed shores in 1983.

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Table 1. Relative abundance of 43 species on rocky shore of Hatakejima Island.

cc: abundant, c: common, r: rare, blank: not found.

Species	Area	I								II								III								IV											
	Section	1	2	3	4	5	6	7	8	9	11	14	15	17	23	24	25	26	27	28	29	30	31	32	33	34	35	39	40	41	42	43					
Cnidaria																																					
<i>Anthopleura japonica</i> Verrill		c	cc	cc	c	c	c	cc	c	cc	cc	cc	c	cc	r	c	c	c	r	c	c	c	cc	c	r	c	c	c	c	r	r	c					
Tentaculata																																					
<i>Zoobotryon pellucidum</i> Ehrenberg		c	cc	cc	cc	cc	r	c	cc						r		r	r		r	r		r	c													
<i>Dakaria subovoidea</i> (d'Orbigny)		c	c	c	c	r	r	c	c			r	r	r	c	cc	cc	cc	c	c	r	r	r	cc		c	cc	c	c	c	c	c					
Annelida																																					
<i>Pomatoleios kraussi</i> (Baird)		c	c	c	c	cc	r	cc	c	c	cc	c	c	c	c	cc	cc	c	c	c	c	cc	c	c	r	cc	cc	c	c	c	c	c					
Arthropoda																																					
<i>Pollicipes mitella</i> (Linné)		c	r	r	r					c		c	r		c	r		c	r	r	r		c	c	r	c		c	cc	cc	cc	cc					
<i>Chthamalus challenger</i> Hoek		cc	cc	cc	cc	c	cc	c	cc	cc	cc	cc	c	cc	cc	cc	c	cc	c	cc	cc	cc	cc	cc	c	cc	cc	cc	cc	cc	cc	cc					
<i>Balanus albicostatus albicostatus</i> Pilsbry			r	r	r	r	r	r	r		r	r	r	r		r	r					r	r	r		r		r									
<i>B. amphitrite amphitrite</i> Darwin		r	c	cc	cc	cc	cc	cc	cc	cc	c	cc	c	c	r	r	c	r	r	c	c	c	c	r	r	r	c		r			r					
<i>B. tintinnabulum volcano</i> Pilsbry		c		c		r							r			c		c		c	c	c	r	r		c		c	c	c	cc	r					
<i>Tetracilita squamosa japonica</i> Pilsbry		r				r						r	cc	r	r	r	r	cc	r	cc	cc	cc	cc		r	cc		cc	cc	cc	cc	cc					
<i>Clibanarius virescens</i> (Krauss)		c		c	c	c		c	r		c			c		c		c					cc	r			c	c	r	c	c	r					
<i>Pagurus geminus</i> McLaughlin			r			r	c	c			c	c	r	c				c	r						r	r			r		r						
<i>Hemigrapsus sanguineus</i> (De Hann)						r		r																	r												
<i>Gaetice depressus</i> (De Hann)			r					r						r																							
Mollusca																																					
<i>Liolophura japonica</i> (Lischke)		r	r							r	r	c		c	r	r		cc	r	c	c		c	c	r	cc	c	cc	c	cc	cc	cc					
<i>Cellana toreuma</i> (Reeve)											r				r			r	c	c				r		r	r	c	c	c	c						
<i>C. grata</i> (Gould)		r																	r	r						r		r			c						
<i>C. nigrolineata</i> (Reeve)		c										c		r	c			r	c					r		c		c	c	c	c	c					
<i>Collisella heroldi</i> (Dunker)		c	c					c	c	c	c	c		c	c	c		c	c	cc	c		c	c	c	c	c	c	c	c	cc	c					
<i>Patelloida saccharina</i> (Linné)		c	c			c	c	r	c	cc	c	c	r	cc	c	c	r	c	r	cc	c		cc	cc	c	c	cc	cc	cc	cc	cc	cc					

Table 2. Relative abundance of 43 species on boulder beach, sand beach and sand-mud flat of Hatakejima Island.
cc: abundant, c: common, r: rare, blank: not found.

Species	Section	Boulder beach									Sand beach		Sand-mud flat		
		2	6	19	20	21	22	36	37	38	10	12	13	16	18
Cnidaria															
<i>Actinia equina</i> (Linné)							c								
<i>Anthopleura japonica</i> Verrill		c	c	r	r		r	c		r					
<i>Haliplanella luciae</i> (Verrill)		c	c	c	c	r	c	c	c						
Tentaculata															
<i>Dakaria subovoidea</i> (d'Orbigny)		c						r							
Annelida															
<i>Eunice aphroditois</i> (Pallas)										c					
<i>Pomatoleios kraussi</i> (Baird)		c		c	r	c	c	c	c	c					
Arthropoda															
<i>Chthamalus challenger</i> Hoek		cc		r	c		cc	c	cc	c					
<i>Balanus albicostatus albicostatus</i> Pilsbry				r	r										
<i>B. amphitrite amphitrite</i> Darwin		r	c	c	c	c	c	r	r	r					
<i>Tetraclita squamosa japonica</i> Pilsbry					r										
<i>Clibanarius virescens</i> (Kruass)		cc		cc		cc	cc	cc	r	cc					
<i>Pagurus geminus</i> McLaughlin			r	cc	c	c	cc	c	r	c			cc	c	
<i>P. dubius</i> (Ortmann)													cc		
<i>Petrolisthes japonicus</i> (De Haan)		cc		cc	c	cc	cc	cc	cc	cc					
<i>Leptodius exaratus</i> (H. Milne Edwards)		c	c	c	r	c	c	c		c					
<i>Etisus laevimanus</i> Randall		r				c									
<i>Pilodius nigrocrinitus</i> Stimpson		c						c		c					
<i>Pilumnus vespertilio</i> (Fabricius)		c					r			r					
<i>Hemigrapsus sanguineus</i> (De Haan)		c	r	c	c	c	cc	c	c	c					
<i>H. penicillatus</i> (De Haan)														c	
<i>Gaetice depressus</i> (De Haan)		r	cc	c	cc	c	cc	cc	cc	c			c	c	

Table 3. Patterns of relative abundance of common rocky shore animals in the four Areas.

Pattern of abundance	Species
I > II, III, IV	<i>Zoobotryon pellucidum</i> , <i>Balanus amphitrite amphitrite</i> , <i>Littorina brevicula</i> , <i>Adula astrata</i> , <i>Styela plicata</i>
IV > I, II, III	<i>Pollicipes mitella</i> , <i>Balanus tintinnabulum volcano</i> , <i>Tetraclita squamosa japonica</i> , <i>Liolophura japonica</i> , <i>Cellana grata</i> , <i>C. nigrolineata</i> , <i>Patelloida saccharina</i> , <i>Septifer virgatus</i> , <i>Echinostrephus aciculatus</i> , <i>Anthocardis crassispina</i>
Equally abundant in the four Areas	<i>Anthopleura japonica</i> , <i>Dakaria subovoidea</i> , <i>Pomatoleios kraussi</i> , <i>Chthamalus challenger</i> , <i>Clibanarius virescens</i> , <i>Pagurus geminus</i> , <i>Collisella heroldi</i> , <i>Nodilittorina exigua</i> , <i>Siphonaria japonica</i> , <i>Mytilus edulis</i>

Table 4. Patterns of occurrence of common boulder shore animals. Boulder shores in Hatakejima Island are located in Areas I, II and IV.

Pattern of occurrence	Species
IV	<i>Cellana nigrolineata</i> , <i>Japeuthria ferrea</i> , <i>Asterina coronata japonica</i>
II & IV	<i>Liolophura japonica</i> , <i>Cellana toreuma</i> , <i>Patelloida saccharina</i> , <i>Monodonta labio</i> , <i>Holothuria moebii</i> , <i>Polycheira rufescens</i> , <i>Anthocardis crassispina</i> , <i>Holothuria pardalis</i> , <i>Afroccumis africana</i>
I, II & IV	<i>Anthopleura japonica</i> , <i>Haliplanella luciae</i> , <i>Pomatoleios kraussi</i> , <i>Chthamalus challenger</i> , <i>Balanus amphitrite amphitrite</i> , <i>Clibanarius virescens</i> , <i>Pagurus geminus</i> , <i>Petrolisthes japonicus</i> , <i>Leptodius exaratus</i> , <i>Hemigrapsus sanguineus</i> , <i>Gaetice depressus</i> , <i>Nanosarman gordon</i>